SPECIFICATION QAA-1414
CAGE Code: 19200
22 June 1995

ITEM SPECIFICATION

FOR THE

BRUSH, CANNON BORE 155MM WITH CARRYING BAG

U.S. Army Armament Reseach Development & Engineering Center
Picatinny Arsenal, NJ 07806-5000

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1. SCOPE

1.1 Scope. This specification covers the requirements, examinations and tests for: a. a 155MM Cannon Bore Brush(CBB) that will be utilized in the cleaning of artillery cannons that are towed or self-propelled (see 6.1) and b. a carrying bag for the brush.

2. APPLICABLE DOCUMENTS

2.1 General. The documents listed in this section are needed to meet the requirements specified in sections 3, 4, and 5 of this specification. This section does not include documents in other sections of this specification or recommended for additional information or as examples. While every effort has been made to ensure the completeness of this list, document users are cautioned that they must meet all requirements documents cited in sections 3, 4, and 5 of this specification, whether or not they are listed.

2.2 Government documents.

2.2.1 Specifications, standards, and handbooks. The following specifications, standards, and handbooks form a part of this document to the extent specified herein. Unless otherwise specified, the issues of these documents are those listed in the issue of the Department of Defense Index of Specifications and Standards (DODISS) and supplement thereto, cited in the solicitation (see 6.2).

SPECIFICATIONS

DEPARTMENT OF DEFENSE

MIL-L-63460 Lubricant, Cleaner and Preservative for Weapons and Weapon systems

(Unless otherwise indicated, copies of the above specifications, standards, and handbooks are available from the DoD Single Stockage Point (DODSSP), Standardization Documents Order Desk, 700 Robbins Avenue, Bldg. 4D, Philadelphia, PA 19111-5094.)

2.3 Non-Government publications. The following document(s) form a part of this document to the extent specified herein. Unless otherwise specified, the issues of the documents which are DoD adopted are those listed in the issue of the DODISS cited in documents not listed in DODISS are the issues of the documents cited in the solicitation (see 6.2).

ASTM D 3951 Standard Practice for Commercial Packaging

(Application for copies should be addressed to American Society for Testing and Materials, 1916 Race Street, Philadelphia, Pennsylvania 19103-1137).

2.4 Order of precedence. In the event of a conflict between the text of this specification and the references cited herein, except references to higher level program unique specifications for this program, the text of this specification takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific exemption has been obtained. (See contract provisions for additional precedence criteria).

3. REQUIREMENTS

3.1 Item/System description. The Cannon Bore Brush(CBB) shall be used to perform routine cleaning of 155MM cannon bores after firings or during periodic maintenance of the cannons. The bore brush is typically screw-mounted to an assembled M15 Artillery Cleaning Staff, doused with MIL-L-63460 Lubricant, Cleaner, and Preservative (CLP) and plunged through the cannon bore to remove residues from cannon firings. An option is to use the swivel eye and a rope to pull the CBB through the cannon bore. A carrying bag is to be provided for the CCB.

3.2 Major Component list and characteristics. The CBB (Figure.1) shall be an assembly comprised of the body, brush bristles, swivel eye rod, staff adapter, and carrying bag.

(a) Body. The body is the main element of the brush. It holds the brush bristles, and rotates around the swivel eye rod and staff adapter. The brush body must freely rotate to allow use without twisting the swivel eye rod or unscrewing the staff adapter.

(b) Brush bristles. The brush bristles when doused with CLP and plunged through the cannon bore shall provide the cleaning of the cannon tube.

(c) Swivel eye rod. The swivel eye rod is used with a rope to pull the bore brush through the cannon bore when desired.

(d) Staff adapter. The staff adapter screws into the cleaning staff (Figure.2) and is used to push or pull the bore brush through the cannon bore. Multiple sections of cleaning staffs are screwed together to provide suitable staff length for cleaning.

(e) Carrying bag. The carrying bag is used for protection of the bristles, carrying, and storage of the CBB.

3.3 Characteristics

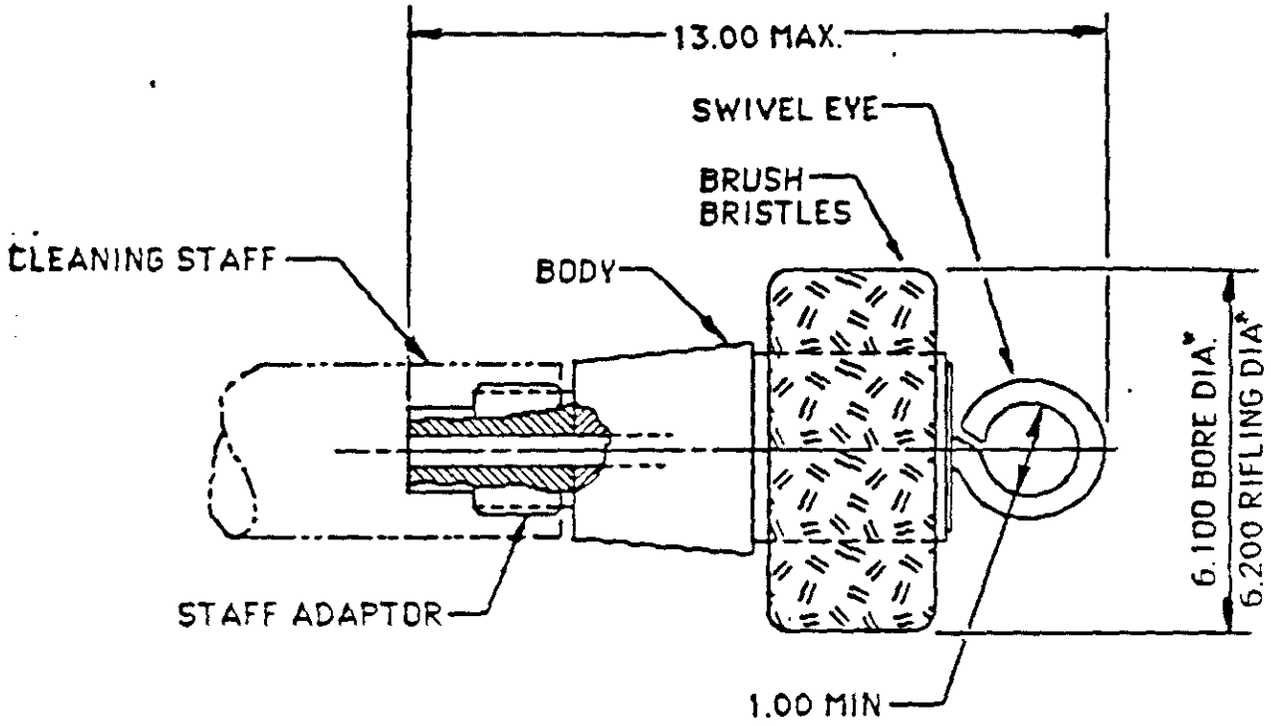
3.3.1 Performance. The cannon bore brush shall provide a satisfactory cleaning of a cannon bore after the cannon has been subjected to live firing of ammunition using the M4A2, M119A2, or the M203A1 propelling charges. A typically dirty tube can be obtained by firing fifteen rounds of ammunition. The cannon bore brush used with CLP shall remove residues from cannon firing that leave carbon deposits, unburned propellant grains, unburned propellant casings, and products of combustion on the lands, and grooves of the cannon tube. A typical cleaning of the cannon tube would be to screw the bore brush to several M15 staff sections, apply CLP to the brush, plunge it through the cannon tube from the breech end out the muzzle end, pull it back to the breech and repeat. The bore is then dry-wiped with a cotton cloth wrapped around the bore brush to remove the "dirty" CLP and other residual materials in the rifled section of cannon bore. Then the bore brush is doused with CLP and the cannon bore is given a final cleaning and coating of CLP as a preservative.

3.3.1.1 Cleanliness. The acceptable level of cleanliness of the cannon bore shall be based on visual inspection. The tube will appear clean with no combustion deposits and no residue or brush bristles. Combustion product deposits in the corners of the grooves shall not exceed 1/16 inch in width and total length shall not exceed 100 inches.

3.3.2 Physical characteristic. The CBB shall conform to the dimensional requirements of Figure 1 and weigh no more than 6 pounds, including the carrying bag.

3.3.3 Interface requirements. The cannon bore brush shall attach to the M15 Artillery Cleaning Staff as intended and shall clean 155MM artillery cannon tubes as specified. Figure 3 shows a typical 155MM artillery cannon tube which the CBB is to clean.

3.3.4 Reliability. The CBB shall give reliable service for its intended use for minimum of 1,000 cleanings. A cleaning cycle is defined as one complete insertion and extracting of the brush coated with CLP along the entire rifled section of 39 caliber 155MM cannon tubes.



*Contractor shall select the brush bristle diameter to clean cannon bores as shown in Figure 3.

FIGURE 1
CANNON BORE BRUSH

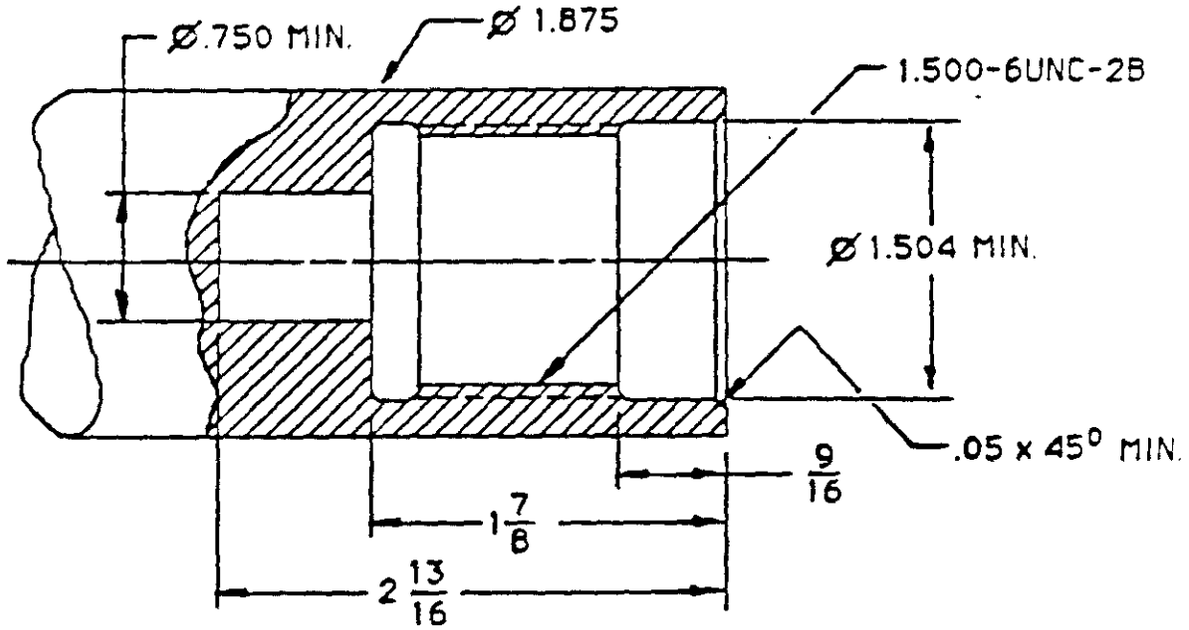
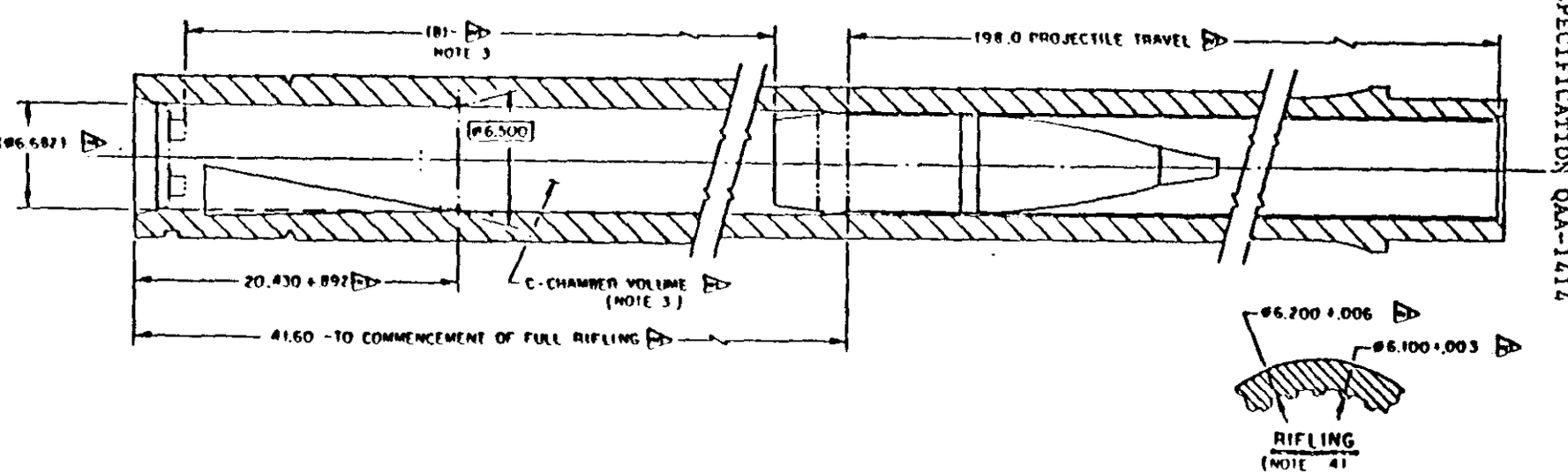


FIGURE 2
M15 STAFF INTERFACE

M199 CANNON / PROJECTILE PARAMETERS

NOTES:-

1. - SPEC MIL - A - 2550 AND ANSI Y14.5M-1982 APPLY.
2. - SYMBOL ▷ INDICATES INTERFACE DIMENSION.
3. - DEPTH OF PROJECTILE, WITH 1 INCH ENGRAVING
4. - NUMBER OF GROOVES - 48 ▷
   TWIST OF RIFLING - UNIFORM, RIGHT HAND, ONE TURN IN 20.$^{+}_{-}$.02 CALIBERS. ▷
5. -
6. -
7. - CONVERSION FACTOR: SEE SHT 2 OF 21.



M483A1	33.41	1188 in³
M549A1	31.36	1147 in³
Mgr 4		
PROJECTILES	(A)	(C)

CANNON/PROJECTILE DIMENSIONS

Figure 3
TYPICAL CANNON BORE PROFILE

3.3.5 Maintainability. The CBB shall be a throw-away item. No repair of the CCB is permitted. Maintenance of the brush bristles shall be cleaned solely by commercial detergent wash and clean water rinses.

3.3.6 Environmental conditions. The cannon bore brush shall withstand operational temperatures of -50 degrees F to 140 degree F with the cannon tube temperature being as high as 300 degrees F. Storage temperatures can be -65 degrees F to 160 degree F. The cannon bore brush shall not have its functional requirements degrade from atmospheric conditions of moisture, ozone, or ultraviolet rays.

3.3.7 Transportability. The CBB shall be carried with the basic issue items of the howitzer and be stowed in a contractor provided carrying bag with an interior plastic liner for protection of the bristles.

3.3.8 Design and construction. A non-developmental item, using commercial designs and components, and manufacturing and assembly processes, is desired.

3.3.9 Materials, processes, and parts. The cannon bore brush components shall be compatible with CLP and commercially available industrial strength cleaning agents for grease and dirt removal. The brush shall not cause degradation or wear to the cannon bore. The brush bristles should be of a non-sparking material as the CBB can be used with cannon tubes at temperatures above the flash point of CLP. Use of commercial materials, parts, and processes are encouraged. The brush and carrying bag shall be of dull low reflective colors.

3.3.10 Identification and marking. The body of the CBB shall be marked in 0.18 to 0.25 inch high characters either by molding, metal stamp, or rubber stamp. The marking shall have the national stock number (NSN to be provided by the Contracting Officer), the manufacturer's five digit CAGE Code, and the manufacturer's part number.

3.3.11 Interchangeability. Like units, assemblies, and subassemblies shall be physically and functionally interchangeable without modification of the item or equipment to the greatest extent possible.

3.3.12 Safety. The CBB shall have no sharp features or other hazards that could cause injury. The CCB shall not require special training for safe usage.

3.3.13 Human performance/human engineering. No more than two gun crew soldiers shall be required to push the CBB attached to the cleaning staff and doused with CLP through the cannon tube and then pull back through to the breech.

3.3.14 Carrying bag. A suitable carrying, and storage bag shall be provided with the CBB. The bag, made of nylon or other suitable material shall be used for storage of the CBB. The bag shall have a plastic liner for protection of the bristles. The bag shall have an adjustable handle or strap or other means for easy carrying.

3.4 First article. When specified in the contract or purchase order, a sample shall be subjected to first article inspection in accordance with the technical provision herein (see 4.3).

REQUIREMENT/VERIFICATION CROSS REFERENCE MATRIX

METHOD OF VERIFICATION
N/A - Not Applicable
1-Analysis
2-Demonstration
3-Examination
4-Test

CLASSES OF VERIFICATION
A-Design Verification
B-First Article Inspection
C-Conformance Inspection

Section 3 Requirement	Verification Method N/A	1	2	3	4	Verification Class A	B	C	Section 4
3.3.1					X		X		4.5.1
3.3.2				X			X	X	4.5.2
3.3.3				X			X	X	4.5.3
3.3.4		X					X	X	4.5.4
3.3.5	X								
3.3.6					X		X		4.5.5
3.3.7	X								
3.3.8	X								
3.3.9			X				X		4.5.6
3.3.10				X			X	X	4.5.7
3.3.11				X			X		4.5.8
3.3.12				X			X		4.5.9
3.3.13				X			X		4.5.10
3.3.14				X			X		4.5.11

4. VERIFICATION

4.1 Responsibility for inspection. Unless otherwise specified in contract or purchase order, the supplier is responsible for performance of all inspection requirements as specified herein. Except as otherwise specified in the contract or order, the supplier may use his own or any other facilities suitable for the performance of the inspection requirements specified herein, unless disapproved by the Government. The Government reserves the right to perform any of the inspections set forth in the specification where such inspections are deemed necessary to assure supplies and services conform to prescribed requirements.

4.1.1 Responsibility for compliance. All items shall meet all requirements of section 3 and 5. The inspection set forth in this specification shall become a part of the contractor's overall inspection system or quality program. The absence of any inspection requirements in the specification shall not relieve the contractor of the responsibility of ensuring that all products or supplies submitted to the Government for acceptance comply with all requirements of the contract. Sampling inspection, as part of manufacturing operations, is an acceptable practice to ascertain conformance to requirements, however, this does not authorize submission of known defective material, either indicated or actual, nor does it commit the Government to accept defective material.

4.2 Classification of inspections. The inspection requirements specified herein are classified as follows:

a. First article inspection (see 4.3).

b. Conformance inspection (see 4.4).

4.2.1 Inspection conditions. Unless otherwise specified, all inspections shall be performed in accordance with the test conditions specified in 4.5.

4.3 First article inspection.

4.3.1 Submission. The contractor shall submit a first article sample as designated by the Contracting Officer for evaluation in accordance with provisions of 4.3.2. Three samples of the CBB and carrying bag shall be submitted for the First Article Inspection.

4.3.2 Inspections to be performed. As determined by the Government, the first article assemblies, components and test specimens may be subjected to any or all of the examinations and tests specified in this specification (see TABLE II) and be inspected for compliance with any or all requirements of this specification and applicable drawings.

4.3.3 Rejection. If any assembly, component or test specimen fails to comply with any of the applicable requirements, the first article sample shall be rejected. The Government reserves the right to terminate inspection upon any failure of an assembly, component or test specimen to comply with any of the requirements.

4.4 Conformance inspection.

4.4.1 Inspection lot formation. The term "inspection lot" is defined as a homogeneous collection of units of product from which a representative sample is drawn or which is inspected 100 percent to determine conformance with applicable requirements. Units of product selected for inspection shall represent only the inspection lot from which they are drawn and shall not be construed to represent any prior or subsequent quantities presented for inspection. Homogeneity shall be considered to exist provided the inspection lot has been produced by one manufacturer, in one unchanged process, using the same materials and methods, in accordance with the same drawings, same drawing revisions, same specifications and same specification revisions. All material submitted for inspection in accordance with this specification shall comply with the homogeneity criteria specified herein, regardless of the type of inspection procedure which is being applied to determine conformance with requirements.

4.4.2 Examinations and tests.

a. Conformance examination and test. Conformance examinations and tests are specified in 4.5 and Table II. The contractor's quality program or detailed inspection system shall provide assurance of compliance of all the applicable drawing and specification requirements utilizing as a minimum the conformance criteria specified. When cited herein, attributes sampling inspection shall be conducted in accordance with TABLE I below, using the inspection levels stated in Table II.

TABLE I. Attributes sample inspection.

Lot Size	Inspection Levels					
	I	II	III	IV	V	VI
2 to 8	*	*	*	*	5	3
9 to 15	*	*	*	13	5	3
16 to 25	*	*	*	13	5	3
26 to 50	*	*	32	13	5	3
51 to 90	*	*	32	13	13	5
91 to 150	*	125	32	13	13	5
151 to 280	*	125	32	32	20	8
281 to 500	*	125	32	32	20	8
501 to 1200	*	125	80	50	20	13
1201 to 3200	1250	125	80	50	32	13
3201 to 10000	1250	125	125	50	32	13
10001 to 35000	1250	315	125	80	50	13
35001 to 150000	1250	315	125	80	50	13
150001 to 500000	1250	500	200	125	50	13
500001 and over	1250	500	200	125	50	13

Numbers under inspection levels indicate sample size; asterisks (*) indicate one hundred percent inspection. If sample size exceeds lot size, perform one hundred percent inspection. Accept on zero and reject on one or more for all inspection levels.

b. Alternative conformance provisions. Unless otherwise specified herein or provided for in the contract, alternative conformance procedures, methods or equipment, such as statistical process control, tool control, variables sampling or other types of sampling plans, etc., may be used by the contractor when they provide, as a minimum, the level of verification required by the provisions herein. Prior to applying such alternative procedures, methods or equipment, the contractor shall describe them in a written proposal submitted to the Government for evaluation (see 6.3). When required, the contractor shall demonstrate that the effectiveness of each proposed alternative is equal to or better than the specified quality conformance provisions(s) herein. In case of dispute as to whether the contractor's proposed alternative(s) provides equivalent assurance, the provisions of this specification shall apply. All approved alternative provisions shall be specifically incorporated into the contractor's quality program or inspection system, as applicable.

TABLE II. Conformance inspection.

Description	Requirement	Method	First Article	Confor.	Insp. Level*
Cleanliness	3.3.1	4.5.1	X		
Physical Characteristic	3.3.2	4.5.2	X	X	V
Interface req.	3.3.3	4.5.3	X	X	V
Reliability	3.3.4	4.5.4	X	X**	
Maintainability	3.3.5	None			
Environmental Cond.	3.3.6	4.5.5	X		
Transportability	3.3.7	None			
Design and construction	3.3.8	None			
Materials, process,parts	3.3.9	4.5.6	X		
ID/Marking	3.3.10	4.5.7	X	X	V
Interchang.	3.3.11	4.5.8	X		
Safety	3.3.12	4.5.9	X		
Human perf/human Eng.	3.3.13	4.5.10	X		
Carrying bag	3.3.14	4.5.11	X		

*See TABLE I
**See 4.5.4

4.5 Methods of inspection.

4.5.1 Cleanliness. The 155MM cannon tube shall be conditioned before the cleanliness testing. The conditioning of the cannon tube prior to cleaning will be based on live fire of 15 rounds of ammunition using the M4A2 propellant charges at low zone. When the above condition is achieved, the cannon tube shall be cleaned with no more than four strokes brush action. The four strokes are defined as follows:

a. Stroke one, insertion of M15 artillery cleaning staff fitted with the CBB and pushed through entire rifled section of the cannon and retracted. The bristles are doused by pouring the cleaning, lubricants, and preservatives(CLP) out of a container before the insertion.

b. The above procedure is repeated for stroke two, and three.

c. Stroke four, insertion of M15 artillery fitted with bore brush and wrapped with dry cloth, and pushed through entire rifled section of cannon, and retracted.

After the above cleaning process, the area inside the cannon bore shall be inspected 100% for cleanliness and meet the requirements stated in 3.3.1.1.

4.5.2 Physical characteristics. To determine conformance to 3.3.2, dimensional inspection shall be performed per Figure 1, and the CBB weighed.

4.5.3 Interface requirements. To determine conformance to 3.3.3, an inspection shall be performed to verify that the CBB attaches to the M15 Artillery Cleaning Staff as intended.

4.5.4 Reliability. To verify conformance to 3.3.4, a component certification shall be obtained. The certification shall provide evidence that the CBB will provide the required minimum number of cleanings. The certification shall be included with each inspection lot.

4.5.5 Environmental test To determine conformance to 3.3.6, a test shall be performed as follows:

a. The CBB shall be subjected to the temperature conditioning of -65 degrees F for 24 hours. After this temperature conditioning, the CBB shall be visually inspected. The CBB shall not show any degradation.

b. The CBB shall be subjected to the temperature conditioning of 160 degrees F for 24 hours. After this temperature conditioning, the CBB shall be visually inspected. The CBB shall not show any degradation.

4.5.6 Materials, process, and parts. To determine conformance to 3.3.9, the supplier shall demonstrate through analysis or demonstration that requirements are met.

4.5.7 Identification and marking. To determine conformance to 3.3.10, a visual inspection shall be performed to verify that the marking on the CBB meets the stated requirement.

4.5.8 Interchangability. The cannon bore brush may be used with any 155MM cannon in the conduct of the First Article test.

4.5.9 Safety. To determine conformance to 3.3.12, visual inspection shall be performed to verify that the brush has no sharp features, and is unlikely to cause injury to users.

4.5.10 Human Performance/Human Engineering. To determine conformance to 3.3.13, an inspection shall be conducted to verify that no more than two operators are required during the cleaning operation.

4.5.11 Carrying bag. To determine conformance to 3.3.14, visual inspection shall be performed to verify that the bag meets the requirements stated in 3.3.14.

5. PACKAGING

5.1 Packaging Packaging requirements shall be as specified in the contract or order (see 6.2).

5.2 Marking Unless otherwise specified (see 6.2), marking shall be in accordance with ASTM D 3951.

6. NOTES

(This section contains information of a general or explanatory nature that may be helpful, but is not mandatory.)

6.1 Intended use. The CBB is used for routine cleaning of 155MM cannon bores after live firings or during periodic maintenance of the cannon.

6.2 Acquisition requirements. Acquisition documents must specify the following:

a. Title, number and date of this specification.

b. Issue of DODISS to be cited in the solicitation, and, if required, the specific issue of individual documents referenced (see 2.2.1).

c. Requirements for submission of first article sample.

d. Applicable stock number.

e. Packaging requirements, e.g. CBB to be shipped with CBB in carrying bag.

f. Serialization requirements, if applicable.

g. Certificate of conformance for each lot or shipment of product.

6.3 Submission of alternative conformance provisions. All contractor proposed alternative conformance provisions will be submitted to the Government for evaluation/approval as directed by the contracting activity.

6.4 Subject terms (key word) listing.

Cleaning, Lubricants, and Preservatives(CLP)
Staff adapter
Swivel eye rod